BLOWER MOTOR

TECHNICAL FIELD

The present invention relates to a blower motor.

BACKGROUND ART

The conventional blower motor includes the case body having the intake formed at the cover which is formed at one side thereof and the exhaust formed at the peripheral wall thereof; the motor with the fluid dynamic bearing, installing in the case body; and the impeller which is fixed to the rotating member of the motor so as to locate at the outer circumferential part of the motor, having the cover plate which is formed at the opposite side of the intake, and capable of sucking in air from the intake by rotating and discharging from the exhaust by rotating.

For the above-mentioned blower motor, the pressure in each portion is as indicated by the rotating of the impeller, that is, "intake < air pressure < exhaust". Therefore, the impeller is drawn near the intake and hit the cover. To solve such problem, the blower motor needs the thrust supporting mechanism as the ball bearing.

Accordingly, it is an object of the present invention to provide a blower motor which utilizes the characteristics of and can prevent the movement of the impeller so as to hit the case body by rotating certainly.

The present invention is understood to encompass embodiments which include all or only a portion of the above objects, features and advantages which, unless recited in claims defining the invention, are understood not to limit interpretation of such claims. The above, and other objects, features and advantages of the present invention will become apparent from the following description read in conjunction with the accompanying drawings, in which like reference numerals designate the same elements.

It is to be expressly understood, however, that the drawings are for the purpose of illustration and

description only, and are not intended as a definition of the limits of the invention.

SUMMARY OF THE INVENTION

Accordingly, the blower motor in the present invention includes the case body having the intake formed at the cover which is formed, at least, at the one side and the exhaust formed at the peripheral wall; the motor with the fluid dynamic bearing, installing in the interior or exterior portion of the case body; the impeller which is fixed to the rotating member of the motor so as to locate at the outer circumferential part of the motor or the above-mentioned interior portion of the case body of the motor, having the cover plate which is formed at the either upper surface or lower surface, or the both surfaces, and capable of sucking in air from the intake by rotating and discharging from the exhaust by rotating; the upper and lower pressure chamber which adds pressure so as to press the impeller to the thrust direction, installed between the outer circumferential part of the upper and lower cover plate of this impeller and the interior portion of the case body which faces the outer circumferential part; and the upper and lower valve chamber which discharges the pressure air in the upper and lower pressure chamber to the exterior portion.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view showing a first embodiment of the present invention;

FIG. 2 is a front view showing a first embodiment of the present invention;

FIG. 3 is a bottom view showing a first embodiment of the present invention;

FIG. 4 is a cross-sectional view taken along a line 4-4 in FIG. 1;

FIG. 5 is an explanation view of a case showing a first embodiment of the present invention;

FIG. 6 is an explanation view of a motor showing a first embodiment of the present invention;

FIG. 7 is an explanation view of an impeller showing a first embodiment of the present invention;

FIG. 8 is an explanation view of an impeller in action to a thrust direction showing a first embodiment of the present invention;

FIG. 9 is a plan view showing a second embodiment of the present invention;

FIG. 10 is a cross-sectional view taken along a line 10-10 in FIG. 9;

FIG. 11 is an explanation view of an impeller showing a second embodiment of the present invention;

FIG. 12 is a plan view showing a third embodiment of the present invention;

FIG. 13 is a cross-sectional view taken along a line 13-13 in FIG. 12;

FIG. 14 is an explanation view of an impeller showing a third embodiment of the present invention;

FIG. 15 is a plan view showing a fourth embodiment of the present invention;

FIG. 16 is a cross-sectional view taken along a line 16-16 in FIG. 15;

FIG. 17 is an explanation view of an impeller showing a fourth embodiment of the present invention;

FIG. 18 is a plan view showing a fifth embodiment of the present invention;

FIG. 19 is a cross-sectional view taken along a line 19-19 in FIG. 18;

FIG. 20 is an explanation view of an impeller showing a fifth embodiment of the present invention;

FIG. 21 is a plan view showing a sixth embodiment of the present invention;

FIG. 22 is a cross-sectional view taken along a line 22-22 in FIG. 21;

FIG. 23 is an explanation view of an impeller showing a sixth embodiment of the present invention;

FIG. 24 is a plan view showing a seventh embodiment of the present invention;

FIG. 25 is a cross-sectional view taken along a line 25-25 in FIG. 24;

FIG. 26 is an explanation view of an impeller showing a seventh embodiment of the present invention;

FIG. 27 is a plan view showing an eighth embodiment of the present invention;

FIG. 28 is a cross-sectional view taken along a line 28-28 in FIG. 27;

FIG. 29 is an explanation view of a motor showing an eighth embodiment of the present invention;

FIG. 30 is a plan view showing a ninth embodiment of the present invention;

FIG. 31 is a front view showing a ninth embodiment of the present invention; and

FIG. 32 is a cross-sectional view taken along a line 32-32 in FIG. 30.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Preferred embodiments of the present invention are described in more detail below referring to the accompanying drawings.

An understanding of the present invention may be best gained by reference Figs. 1 to 8. Reference numeral 1 is a blower motor of the present invention which is comprised of a case 6 covered by a cover 3 having an intake 2 which is formed at a center portion of one side surface, being formed an exhaust 5 at a peripheral wall 4; a motor 7 installed into the case 6, having a fluid dynamic bearing which is driven at a high speed; and impeller 8 which is fixed to a revolving member of the motor 7 so

as to position at the outer circumferential part of the motor 7, capable of introducing air from the intake 2 of the case body 6 by rotation and discharging air from the exhaust 5.

The case 6 having attachment parts 11, 11 which is formed insertion hole 10, provided at an outer circumferential part thereof, inserted a screw 9 therein is composed of a case body 12 having the peripheral wall 4 formed the exhaust 5; a lower intake 13 which is formed at a bottom plate 12a of the case body 12; and the cover 3 which is formed the intake 2 which covers an upper opening part 12b of the case body 12.

The motor 7 is further composed of a base plate 14 fixed at an inner bottom surface of the case body 12 of the case 6, having a motor drive circuit (not shown); a shaft 15 fixed so as to project from the base plate 14 upwardly; a sleeve 17 provided at the outer circumferential part of the shaft 15 through some spaces 16; a rotor 18 arranged permanent magnets attached to the outer circumferential part of the sleeve 17; a coreless waveform continuation coil 19 provided to the base plate 14 so as to position at the outer circumferential part of the rotor 18; a back yoke 20 which is installed so as to locate at the outer circumferential part of the coreless waveform continuation coil 19; a hub 21 as a rotating member supports the sleeve 17, rotor 18 and back yoke 20, covering the outer circumferential part of the upper part of the shaft 15 and the back yoke 20; a ring-shaped thrust magnet 23, attaching fixedly to an upper concave part 22, which covers the shaft 15, of the hub 21; and a ring-shaped thrust magnet 24 which is fixed to the upper part of the shaft 15 so as to face to the thrust magnet 23.

The impeller 8 is comprised of upper and lower cover plates 27, 27, which is formed in the shape of a flange, projecting through a plurality of through holes 26, 26 from the upper and lower ends of a boss part 25 fitted fixedly to the outer circumferential part of the hub 21 as the rotating member of the motor 7; a plurality of blades 28, which is formed in the shape of an arc, dividing by the plural spaces between the upper and lower cover plates 27, 27; and upper and lower pressure chambers 30, 30 which includes concave parts 29, 29 so as to press the upper and lower cover plates 27, 27 to the thrust direction and add pressure between the part adjacent the outer circumferential part of the upper and lower cover plates 27, 27 and inner wall surfaces 6a, 6a of the case body 6. In addition, upper and

lower valve chambers 31, 31 are installed between the upper and lower pressure chambers 30, 30 of the impeller 8 and the through holes 26, 26 of the upper and lower cover plates 27, 27.

For the above-mentioned blower motor 1, when the motor 7 is driven, the impeller 8 rotates at high speed; air is sucked in the intake 2 of the case body 6 and lower intake 13 and discharges from the exhaust 5. Therefore, it can blow in at the high pressure and the large air volume, even if it is a smaller type.

Then, since the motor 7 is arranged the rotor 18 and coreless waveform continuation coil 19, arranging the permanent magnet with rotating structure at the outer circumferential part of the sleeve 17 which is arranged at the outer circumferential part of the shaft 15 through the space 16, the harmful force which is added to the shaft 15 and sleeve 17 from the magnetic circuit which generates torque.

For this reason, it has just a bearing stiffness which can support the empty weight of the rotor 18 basically.

In addition, even though the impeller 8 rotates at a high speed, when it is generated the difference to the pressure which adds to the upper and lower pressure chambers 30, 30, the impeller 8 moves to the direction of the lower pressure; it is repeated the operation that the high pressure in the pressure chamber 30 is discharged from the valve chamber 31 connected to the pressure chamber 30 to the exterior portion; and the impeller 8 rotates at the balanced position.

Other embodiments of the present invention will now be described referring to FIGS. 9 to 32. Through the drawings of the embodiments, like components are denoted by like numerals as of the first embodiment and will not be further explained in great detail.

A second embodiment of the present invention is shown in Figs. 9 to 11 and is distinguished from the first embodiment by the fact that the impeller 8 is replaced from another impeller 8A. The impeller 8A has smaller thickness of the tip portion thereof rather than that of based end portion so as to be defined the upper and lower valve chambers 31A, 31A as the inclined plane, having the upper and lower guide plates 27A, 27A which are formed inclined planes 32, 32. Inclined planes 33, 33 are formed at inner wall surface of the case body 6A without the lower intake in a bottom surface of a part

corresponding to the inclined planes 32, 32 of the upper and lower guide plate 27A, 27A of the impeller 8A. A blower motor 1A in this way according to the second embodiment has similar advantages to that according to the first embodiment.

A third embodiment of the present invention is shown in FIGS. 12 to 14 and is distinguished from the second embodiment by the fact that the impeller 8A is replaced from another impeller 8B and a case 6B is used. The impeller 8B is formed upper and lower valve chambers 31B, 31B at a plane state, having an outer circumferential part thereof which projects convexly. A blower motor 1B with the impeller 8B and the case 6B according to the third embodiment has similar advantages to that according to the second embodiment.

A fourth embodiment of the present invention is shown in FIGS. 15 to 17 and is distinguished from the second embodiment by the fact that the upper pressure chamber 30 and valve chamber 31 are formed at a plane state, and the discharging of the pressure from the upper part can be operated by the empty weight of the impeller 8C.

A fifth embodiment of the present invention is shown in FIGS. 18 to 20 and is distinguished from the third embodiment by the fact that the upper pressure chamber 30 and valve chamber 31 are formed at a plane state, and the discharging of the pressure from the upper part can be operated by the empty weight of the impeller 8D. A blower motor 1D in this way according to the fifth embodiment has similar advantages to that according to the third embodiment.

A sixth embodiment of the present invention is shown in FIGS. 21 to 23 and is distinguished from the second embodiment by the fact that the impeller 8A is replaced from another impeller 8E, and a case body 6C is used. The impeller 8E includes upper and lower cover plates 27B, 27B that are formed curved surfaces 34, 34 as upper and lower valve chambers 31C, 31C is formed as the curved surface. In addition, the case body 6C includes curved surfaces 35, 35 which are formed at an inner wall surface thereof. A blower motor 1E in this way according to the sixth embodiment has similar advantages to that according to the second embodiment.

A seventh embodiment of the present invention is shown in FIGS. 24 to 26 and is distinguished

from the second embodiment by the fact that the impeller 8A is replaced from another 8F and the case 6A is replaced from another case 6D. The case 6D, which is defined as an inner wall surface, is further includes an impeller 8F which is formed so as the thickness of the impeller becomes thinner according to outer direction; and inclined planes 37, 37 which are smaller than the inclined planes 36, 36 of the upper and lower guide plates 27C, 27C of the impeller 8F. A blower motor 1F in this way according to the seventh embodiment has similar advantages to that according to the second embodiment.

An eighth embodiment of the present invention is shown in FIGS. 27 to 29 and is distinguished from the second embodiment by the fact that the motor is attached to the bottom part of the case 6A. A blower motor 1G in this way according to the eighth embodiment has similar advantages to that according to the second embodiment.

A ninth embodiment of the present invention is shown in FIGS. 30 to 32 and is distinguished from the second embodiment by the fact that the case 6A is replaced from another case 6E which has a cover body 39 having the intake 2 formed at a peripheral wall 38. A blower motor 1H with the case 6E according to the ninth embodiment has similar advantages to that according to the second embodiment.

In addition, the impeller with cover plate formed at the upper and lower surfaces is explained in the above-mentioned embodiments of the present invention. In addition, the impeller may be formed the cover plate at either upper surface or lower surface. In this case, the impeller just is biased to the side of the cover plate by the empty weight, attraction (repulsion) generated by magnet, or a kind of that.

As set forth above, the advantages of the invention are as follows:

(1) The movement of the impeller so as to hit the case body by rotating, can be prevented by the pressure chamber and the valve chamber, since the blower motor in the present invention includes the case body having the intake formed at the cover which is formed, at least, at the one side and the exhaust formed at the peripheral wall; the motor with the fluid dynamic bearing, installing in the interior or exterior portion of the case body; the impeller which is fixed to the rotating member of the motor so as to locate at the outer circumferential part of the motor or the above-mentioned interior

portion of the case body of the motor, having the cover plate which is formed at the either upper surface or lower surface, or the both surfaces, and capable of sucking in air from the intake by rotating and discharging from the exhaust by rotating; the upper and lower pressure chamber which adds pressure so as to press the impeller to the thrust direction, installed between the outer circumferential part of the upper and lower cover plate of this impeller and the interior portion of the case body which faces the outer circumferential part; and the upper and lower valve chamber which discharges the pressure air in the upper and lower pressure chamber to the exterior portion.

Accordingly, as utilizing the characteristics of the fluid dynamic bearing, the damage of the impeller or the case body can be prevented certainly.

(2) As discussed above, the invention can be implemented by only forming the pressure chamber and the valve chamber, without additional component.

(3) As discussed above, the impeller can rotate at the balanced position by the movement of the upper and lower valve chamber for the open or close direction.

Therefore, the stable blow can be provided.

(4) Also claims 2 and 3 have the same effect as the above (1) to (3).

INDUSTRIAL APPLICABILITY

The present invention is applied for the industry of producing the blower motor.